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## BUR CLOVER.

By CHARLES V. PIPER, *Agrostologist in Charge*, and ROLAND MCKEE, *Assistant Agrostologist, Office of Forage-Crop Investigations*.

### CONTENTS.

	Page.		Page.
Introduction.....	1	Bur clover for pastures.....	8
Kinds of bur clover.....	2	Use as a cover and green-manure crop.....	9
Climatic adaptations.....	3	Value for hay.....	10
Soil preferences.....	4	Rotations.....	10
Time of seeding.....	4	Growing and harvesting seed.....	11
Sowing the seed.....	5	Yield and weight of seed.....	12
Germination of the seed.....	5	Chemical analyses.....	13
Inoculation.....	6	Insect enemies.....	14
Volunteer crops of bur clover.....	7	Objections to bur clover.....	14

### INTRODUCTION.

Bur clovers are annual legumes, much like ordinary clovers, but the small yellow flowers are in clusters of 5 to 10, and the coiled pods are commonly beset with spines, thus forming the so-called bur. The roots are fibrous and do not extend very deep. Most of the plants are branched at the crown with 10 to 20 or more spreading or decumbent branches 6 to 30 inches long, which in fruit are thickly beset with the burs. Well-developed plants may contain more than 1,000 pods. Bur clovers are valuable agriculturally only where the winters are mild enough for them to withstand them. In the United States this embraces the cotton-growing area of the South and all of the Pacific coast west of the Cascade and Sierra Nevada Mountain Ranges.

There is a growing appreciation of the value of bur clover, from the fact that it so readily maintains itself with little or no reseeding

NOTE.—This bulletin is intended for general distribution in the cotton regions and on the Pacific coast.

and because each year it can be depended upon to add humus and nitrogen to the soil without sacrificing the regular summer crop of the farm. For the South especially, bur clover is the cheapest legume that serves as a winter cover crop, thus preventing the washing of the soil. In addition to its value as a winter cover crop, it furnishes some pasturage and improves the soil. By the use of bur clover alone many instances are reported where the cotton crop has been materially increased each season.

### KINDS OF BUR CLOVER.

There are two kinds of bur clover cultivated in the United States, namely, the spotted or southern bur clover (*Medicago arabica*;

fig. 1) and the toothed or California bur clover (*Medicago hispida denticulata*; fig. 2). The spotted or southern bur clover may be readily distinguished by the purple spot in the center of each leaflet. The pods of the two species are also quite distinct, as shown in figures 3 and 4. A pod of spotted bur clover contains from two to eight seeds, while in toothed bur clover the usual number is three, but often as many as five. At the present time only these two species of bur clover are of importance in American agriculture. There

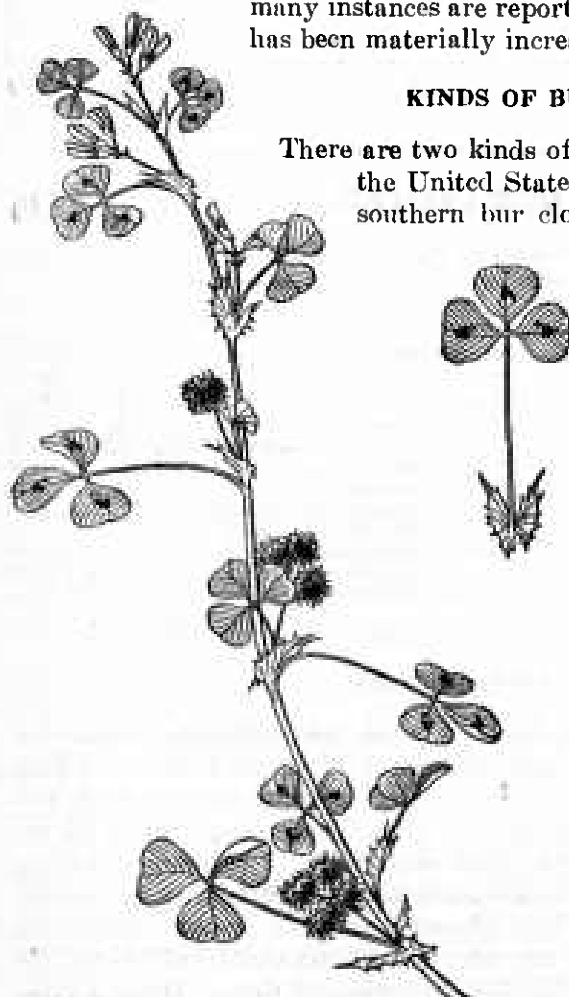


FIG. 1.—Spotted bur clover (*Medicago arabica*).

are in addition about 35 other species, some of which have large and smooth burs, while others have very hard and spiny burs. All of these are native to the Mediterranean region, although few occur naturally as far eastward as Turkestan. Those with large spineless burs, such as button clover (*Medicago orbicularis*), snail clover (*Medicago scutellata*), and tubercled clover (*Medicago tuberculata*), are being tested at the present time to determine their value for this country. There

is also a variety of the spotted bur clover with spineless pods and a similar variety of the toothed bur clover. Thus far it does not appear that there is any great advantage in these spineless forms.

### CLIMATIC ADAPTATIONS.

All of the bur clovers are normally winter annuals; that is, in the country to which they are native they germinate in the autumn, grow during the fall, winter, and early spring, and mature early in summer. They are thus primarily adapted to regions with mild, moist winters, and in this country they maintain themselves naturally only in the areas shaded on the accompanying map (fig. 5). Northward from the areas indicated they succeed fairly well when the seed is sown in the spring, but they are scarcely able to maintain themselves by reseeding from year to year.

On the Pacific coast, especially in California, spotted bur clover is now nearly as abundant as toothed bur clover and seems equally well adapted to the natural conditions. In the Southern States spotted bur clover is decidedly better adapted to the conditions than toothed bur clover.

The latter, however, appears able to maintain itself well from year to year in portions of the cotton belt, especially in the less humid portions of Texas. There is also good evidence to indicate that toothed bur clover is destroyed in winter by cold that does little or no harm to the southern bur clover. The latter, therefore, is to be preferred in the cotton States, where toothed bur clover can not be so highly recommended.

Bur clover may be pastured in North Carolina by the middle of February, and near the Gulf coast it furnishes practically continuous

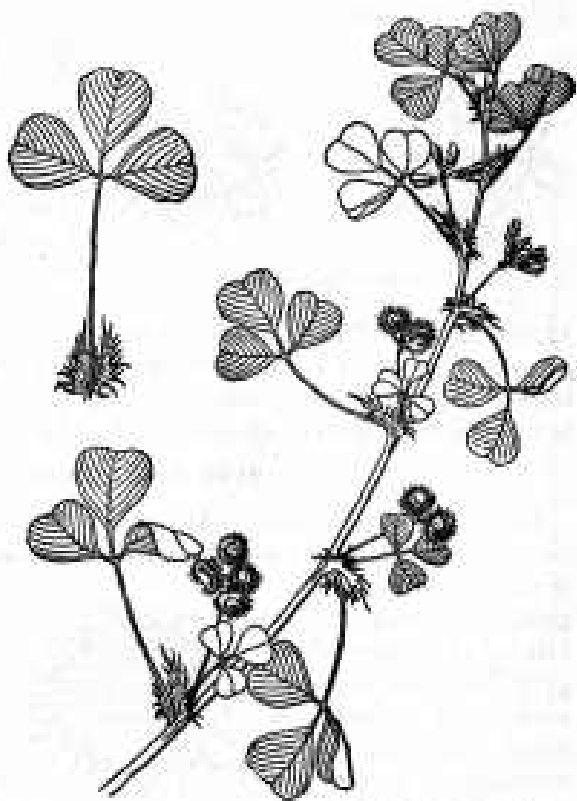


FIG. 2.—Toothed bur clover (*Medicago lupida denticulata*).

winter pasturage. No other cultivated legume will make more growth during cool weather in this area.

### SOIL PREFERENCES.

Bur clover will succeed in practically all types of soil, but loams are most suitable. In the South the plants grow best in soils rich in lime, but thrive well enough in soils poor in this substance. On the Pacific coast, even where the soils are poor in lime, bur clover grows vigorously. Apparently the plant is not indifferent to lime, but it will succeed in noncalcareous soils. As a rule it prefers moist, well-drained soils, but in California it grows vigorously in adobe

soils, which are often poorly drained. Where the soil is very moist the plants mature much later than on well-drained land. The California Agricultural Experiment Station found that toothed bur clover would grow luxuriantly in alkali soil containing

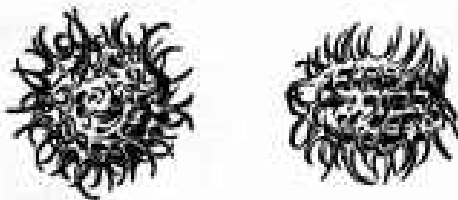


FIG. 3.—Pods of spotted bur clover.

11,300 pounds of carbonate of soda to an acre in the top 30 inches of soil. The plant is therefore apparently as tolerant of alkali as is barley. In general, bur clover succeeds well in slightly alkaline soils, but not in those heavily charged with salts.

### TIME OF SEEDING.

Bur clover should always be sown in late summer or fall. In the cotton States the best time of seeding is the month of September, but it may be seeded in Au-

gust, and seedlings as late as December often give favorable results, even as far north as South Carolina. Late seedlings, however, are to be avoided whenever possible, as but little

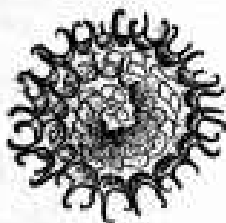


FIG. 4.—Pods of toothed bur clover.

fall and winter growth is secured from such plantings. Hulled seed germinates more readily than seed in the bur, so that where hulled seed is used the time of sowing may be delayed on the average from two to four weeks longer than if seed in the bur is used.

In California, where the summers are always dry, seeding may be delayed until just before the fall rains begin. If the sowings are to be made on irrigated land, the best average date is about the first of October, as by seeding at this time only a single irrigation is ordinarily necessary; that is, the one made just before seeding. If the

seeding is done earlier a second irrigation may be necessary before the rains come, as otherwise the young plants are quite sure to be injured by drought.

### SOWING THE SEED.

Hulled seed may be sown by a grain drill with a press-wheel attachment, or by any method of broadcasting, using about 15 pounds of seed per acre. A firm seed bed is desirable, and especial care should be taken to cover the seed thinly. Under most conditions broadcasting will be found most satisfactory, but the seed should be covered with a light harrow. Where moisture conditions are entirely favorable good stands have frequently been obtained by merely scattering the seed on the surface, but whenever practicable harrowing is recommended.

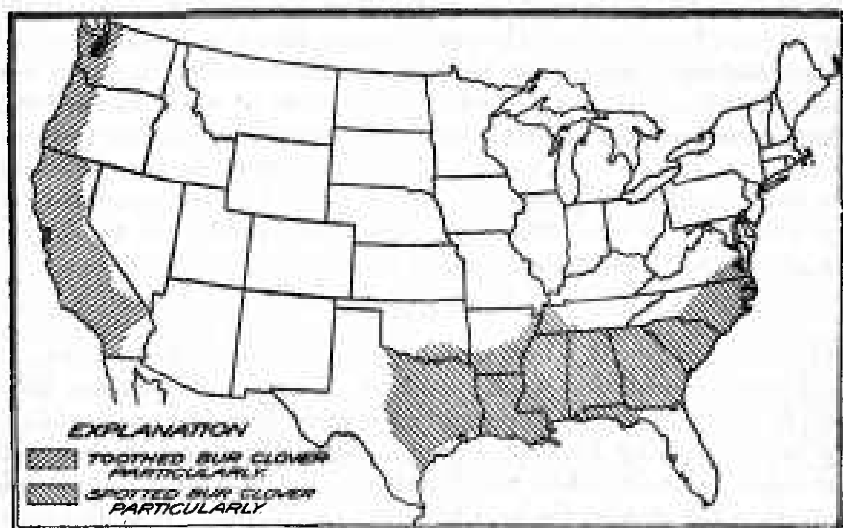


FIG. 5.—Outline map of the United States, showing the regions to which bur clover is adapted.

When the seed is sown in the bur, broadcasting is the only practicable method. To obtain a full stand by this method, from 3 to 6 bushels of seed per acre are necessary, followed by a harrowing.

In the regions, however, which are well adapted to bur clover it is much more economical as a rule to begin with a light seeding and to depend in subsequent years on the volunteer crop, where this is practicable.

### GERMINATION OF THE SEED.

Good seed of the bur clovers retains its vitality for a number of years. In all cases it contains a considerable proportion of hard seeds, most of which do not germinate until the second year. This is particularly true where the seed is sown in the bur, as the bur tends

to keep moisture from reaching the seeds. Partly on account of the hard seeds and partly on account of the protection of the bur, difficulty is often experienced in securing a stand of bur clover.

Independent investigations by McNair,<sup>1</sup> of the Office of Farm Management, and by Duggar and Tisdale,<sup>2</sup> of the Alabama Agricultural Experiment Station, have shown that this difficulty of germination can be largely overcome by treating the seed in the bur with boiling water before it is sown. As a result of these investigations the following method is recommended: (1) Empty a bag of the burs in a tub of cool water and let them stand for two hours, stirring occasionally to loosen as much dirt as possible for reinoculating the burs at the end of the hot-water treatment; (2) remove the burs from the tub of cool water, put in a bag, and immerse for five minutes in a barrel of water almost scalding hot; (3) plunge the bag of burs for one minute in water kept boiling hot; (4) lift the bag of burs from the boiling water, plunge first into a barrel of cool water, and then empty into the tub of muddy water in which the seed was first placed. The muddy water tends to inoculate the burs, which have presumably had their inoculating bacteria killed by immersion in the boiling water. This inoculation is not necessary where the land to be planted is already known to be inoculated for bur clover. Sow the seed immediately or spread out to dry as rapidly as possible in an airy, shady place.

### INOCULATION.

On the Pacific coast, where bur clover is now established practically everywhere, inoculation is not necessary. In the cotton States, however, lack of inoculation apparently has often been the cause of failure in establishing bur-clover crops, especially where hulled seed was sown. Usually when seed is sown in the bur there are enough bacteria in the dust on the burs to insure inoculation. It is desirable, however, in planting bur clover for the first time, that farmers do not go to the expense of purchasing a large quantity of seed, but that they plant a comparatively small area, inoculating the soil either by the soil-transfer method or, in the absence of inoculated soil, by the use of pure cultures. When once a patch of bur clover has been grown successfully on a farm the whole farm can easily be inoculated by scattering soil from the places where the bur clover grew successfully.

### THE SOIL-TRANSFER METHOD.

The soil-transfer method is the surest known way to secure the inoculation of any legume. The soil should be taken from a spot where

<sup>1</sup> McNair, A. D. Boiling bur clover seed to hasten germination. *In* Prog. Farmer [Raleigh, N. C.], v. 29, no. 38, p. 997. 1914.

<sup>2</sup> Duggar, J. F., and Tisdale, H. B. Bur clover seed; means of hastening their germination. Ala. Agr. Exp. Sta. Circ. 29, p. 113-116. 1914.

bur clover is growing successfully or from fields of alfalfa, yellow trefoil, or melilotus. The same germ inoculates all four of these plants, so that soil from near the roots of any one will inoculate the others. The soil should be taken from the top 8 inches and broadcasted over the area to be planted at the rate of 250 to 500 pounds per acre. The spreading is best done on a cloudy day, as bright sunshine is destructive to the bacteria. If spread in sunshiny weather harrowing immediately is important. Care should always be taken to secure soil free from troublesome weeds or diseases.

On account of the expense involved it is seldom advisable to get large quantities of soil from a distance. It is better to sow but a small patch the first year, which, if successful, will supply abundant soil to use as inoculation for more extensive plantings.

Sometimes inoculation is secured by dusting the seed with well-inoculated soil, using about as much soil as seed, but this should not be depended upon in large plantings.

Even if a little seed is sown without inoculation, especially if the seed be in the bur, some of the plants are quite sure to have nodules on their roots. In this manner large areas of land may be gradually inoculated at merely the expense of a little seed.

#### PURE-CULTURE METHOD.

Pure cultures in glass containers may now be secured for nearly all legume crops. Where these are used, it is strongly recommended that only a small area be planted at first, and preferably on good or manured soil. Pure cultures frequently fail to provide inoculation, so that a farmer should not depend on them alone when sowing large fields of a new legume for the first time. Where soil is not available, however, they furnish the most convenient method of securing inoculation in small plantings.

#### VOLUNTEER CROPS OF BUR CLOVER.

One of the peculiarities of bur clover over most other legumes is the fact that good stands can often be obtained from year to year without additional seeding. On pasture lands, where once established, bur clover will reseed itself indefinitely.

On cultivated land the same thing is true, provided the land is not plowed until some of the burs have ripened. For most summer crops it is impracticable to allow the bur clover to remain on the land so long. This is particularly true of corn and of cotton. Even with these crops a stand for the succeeding fall is sometimes secured by leaving balks in plowing; that is, leaving rows of the bur clover unturned until the plants have ripened their pods. This, however,



necessitates leaving about every tenth row of the old cotton or corn field unplowed until the bur clover is mature, though fewer balks will suffice if the ripened burs are gathered and scattered. When the pods are mature the dried plants should be turned under rather shallow, as, if the seeds are buried deep, the stand will probably be thin. On the whole, however, it is better to grow the bur-clover seed in a separate patch, gather it when ripe, and then sow in the cultivated crop where desired. Under some conditions bur-clover seed will retain its vitality in the soil for two or three years, so that where once well established volunteer stands are common.

### BUR CLOVER FOR PASTURES.

Bur clover is mostly utilized as pasture for hogs, cattle, sheep, and poultry. Horses and mules ordinarily refuse to eat it. Even other farm animals do not eat it readily at first, but soon acquire a taste for the plant and then eat it greedily. In Argentina, where both the toothed bur clover and the spotted bur clover occur, it is said that horses will eat the former quite readily but absolutely avoid the latter. No similar observations have been recorded for California, where both of the species grow together. When bur clover is growing in cultivated lands it is best not to pasture continuously, but to put the stock on the land for only a few hours each day, as this reduces very much the injury by trampling. Few cases have been recorded of bur clover causing bloating to animals, but where the growth is lush care should be exercised. Not only do animals eat the herbage, but sheep especially are very fond of the ripe pods and will lick these up from the ground. Much of the value of range lands in California depends on the large crop of pods produced by the bur clover, which remain in good condition a long time. When the burs are abundant in the pasturage sheep fatten very rapidly. The spines bother the animals but little, but the burs are eaten more readily when they have been softened by the rain.

For permanent pastures in the South a combination of bur clover and Bermuda grass is very satisfactory. The Bermuda grass furnishes pasturage during the warm weather until further growth is stopped by frost, while the bur clover begins to grow with cool weather in the fall and provides pasturage during the winter and spring. Where once established on such pastures it reproduces itself continuously. On Bermuda pastures where bur clover is not established it is recommended that furrows be plowed through the Bermuda grass from 5 to 10 feet apart and seed of bur clover, preferably in the bur, be sown in these plowed furrows in September. Within a year or two the plants that are produced in these plowed furrows will seed the whole pasture. Disking such a pasture in summer tends to stimulate

the Bermuda grass. Broadcasting about 1 bushel of bur-clover seed in the bur to each acre before disking the Bermuda grass will usually give a stand of the bur clover.

### USE AS A COVER AND GREEN-MANURE CROP.

Bur clover alone is commonly used as a green-manure crop in the orchards of California and is often so handled that good volunteer crops are obtained year after year.

In the South, undoubtedly the greatest value of bur clover is due to the fact that it is the cheapest and most easily handled legume that can be used as a combination cover and green-manure crop. Even where it makes a small growth of only a few inches in height, this is sufficient to prevent to a large degree the washing of the land in winter and when plowed under to add sufficient humus and nitrogen to improve materially the following cotton crop. It is the most economical legume to use for this purpose, as when once a stand has been secured and rows of the plants are left to seed it will volunteer from year to year. The same method can be used with corn or any other intertilled summer crop. There is some difficulty in seeding bur clover in standing cotton, as in the harrowing of the bur-clover seed some of the ripe cotton is pulled out of the bolls. On this account the harrowing should be done just after the pickers have been through the field, to avoid as far as possible any injury to the opened bolls.

There are several well-authenticated farm records which show that by the simple use of bur clover in rotation with cotton the yields of cotton have shown marked increase year after year. There is apparently no other legume as satisfactory as bur clover for this purpose. The use of a summer legume crop, like cowpeas or soy beans, is advisable in good rotations, but where cotton is grown continuously it involves the omission of this crop for an entire growing season. Furthermore, when the cowpeas are plowed under, a larger amount of vegetable matter is often added to the soil than is good economy, and it is practicable to do this only at long intervals. It is much cheaper and much more satisfactory to use bur clover, which, after it is once established, does not involve much expense for growing seed, nor does it require the loss of a growing season, as is the case with a summer legume crop. Furthermore, it adds each year a reasonable amount of humus and nitrogen, which in the end gives much more satisfactory results than the turning under of a large green-manure crop at long intervals. Perhaps no one thing will tend to bring about an increased yield from cotton fields more surely and more cheaply than the general use of bur clover to make winter cover and green-manure crops.

## VALUE FOR HAY.

Under favorable conditions bur clover will make a dense stand 18 to 24 inches high. From such dense stands of bur clover, yields of 2 or even 3 tons of hay per acre have been recorded. Unless the stand is very dense, however, bur clover plants lie close to the ground, so as to make mowing very difficult. If bur clover is to be grown for hay, it is preferably sown in mixture with oats or wheat, as with these grain crops the bur-clover plants tend to grow erect. Ordinarily about 5 bushels of bur-clover seed in the bur should be sown to the acre, together with 2 bushels of winter oats or  $1\frac{1}{2}$  bushels of wheat. For growing in this manner, however, hairy vetch is much to be preferred to bur clover, and even crimson clover will ordinarily give larger yields under such conditions than bur clover. Bur-clover hay does not enjoy a high reputation, but comparatively little of this clover is ever utilized as hay.

## ROTATIONS.

Bur clover may be used as a winter crop in rotation with any cultivated summer crop, as before mentioned. Among rotations that have been suggested the following seems desirable:

First year: Cotton; bur clover sown between the rows September 1.

Second year: Corn or soy beans, followed by bur clover.

Third year: Cotton.

A less simple rotation is the following:

First year: Cotton; bur clover sown between the rows September 1.

Second year: Corn, followed by winter oats.

Third year: Oats, followed by soy beans or cowpeas, preferably in rows.

Bur clover sown in the rows September 1. If the soy beans or cowpeas are broadcasted, the bur clover should not be sown before the crop is harvested.

Fourth year: Cotton.

After the clover is once well established, stands of bur clover can generally be secured in such intertilled summer crops as cotton, corn, soy beans, or sorghums. In broadcasted crops, however, such as soy beans, millet, and cowpeas, the shade is so dense that the young bur-clover plants for the most part perish.

The common use by the Chinese of bur clover as a winter green-manure crop to grow in rotation with rice is also worthy of notice. To a slight extent bur clover has thus been used in rotation with rice in Louisiana, but there is every reason to believe that its employment in this manner would prove to be profitable, as the long experience and practice of the Chinese indicate.

The remarkable adaptation of bur clover for use in rotations is due to the fact that it can be seeded with little or no preparation of

the land, provided only that the proper inoculating germs are present in the soil. The only handicap to its general use in this manner, especially where seeding each fall may be necessary, as would be the case with rice, is that it involves a larger and cheaper supply of seed than has yet been available.

### GROWING AND HARVESTING SEED.

#### TOOTHED OR CALIFORNIA BUR CLOVER.

Most of the commercial seed of toothed bur clover comes from California. Much of the seed is harvested as an impurity with wheat and other grain crops, from which it is separated at the mills and warehouses handling grain. On account of the increased demand in recent years, various methods have been used to harvest bur-clover seed directly from pasture lands where there is practically a pure stand and where the burs are produced in abundance. The simplest method is sweeping by hand with large stiff brooms. Among machines that have been used are ordinary mowers, self-rake reapers, combined harvesters, and specially devised suction machines. When the mower, reaper, or harvester is used, the crop must be cut before all the seeds are ripe, as the burs ripen unevenly and drop readily when ripe. As a consequence, a good deal of green material is harvested with the burs, which necessitates careful drying to prevent damage by heating and sweating. Furthermore, on account of the half-prostrate habit of the plants a large part of the crop is left on the ground.

The power suction machine saves all the seed, but the cost of operation is high. When this machine is used the burs are allowed to become perfectly dry, so that they are easily lifted from the ground by air suction.

The method most employed when but a small quantity of seed is to be saved is that of hand sweeping. When this method is used the seed is allowed to ripen thoroughly, and then the vines are cut with an ordinary mowing machine and raked into windrows. The burs are then swept together with large barn brooms and hauled from the field. The burs gathered in this manner are mixed with more or less gravel and other foreign substances, which must be removed before the seed can be satisfactorily hulled or used in the bur. This separation is accomplished by the use of handbarrow screens and an ordinary fanning mill regulated to blow the burs over; or, if running water is handy, a quicker and more satisfactory method is to throw the burs into the water. All heavy substances sink, and the burs and lighter substances are dipped from the stream. To facilitate this method of separation the channel of the stream should be narrowed in the shape of an open V, which aids greatly in collecting

the clean burs. To dip the burs from the water, a large handbarrow with a bottom made of wire netting has been found very satisfactory. The burs are spread on canvas to dry, after which they are ready for the huller. The burs can be successfully hulled with an ordinary clover huller.

A second source of the seed of toothed bur clover, often mixed with spotted bur clover, has been from the burs removed from wool. Bur clover of one or both species is abundant in Argentina and also in Australia, as well as in the Mediterranean countries. The quantity of these burs contained in wool is so large that it has been found profitable to save the seed in European wool-cleaning mills.



FIG. 6.—Seeds of spotted bur clover.

#### SPOTTED BUR CLOVER.

Practically all of the commercial seed of spotted bur clover is grown in the cotton States, and the supply has usually been much below the demand. Thus far the seed has been marketed only in the bur, but there seems no good reason why clean hulled seed should not be produced in commercial quantities. Hulled seed is much more easily sown, and once the land is inoculated the regular seeding of bur clover in cotton would replace to a large degree the dependence on volunteer crops.

Raking or sweeping the ripened pods from the ground is the only method used in harvesting spotted bur-clover seed. When the pods are not perfectly dry, care must be exercised in curing, as otherwise the piles will heat, with consequent injury to the seeds. It is probably due to such heating that the commercial seed so often shows low germination.

Every southern farmer can easily grow his own supply of bur-clover seed at small expense. This is especially recommended at the present time, when the commercial supply of seed is inadequate.



FIG. 7.—Seeds of toothed bur clover.

#### YIELD AND WEIGHT OF SEED.

Bur-clover seed closely resembles that of alfalfa. Formerly much of it was used to adulterate alfalfa seed, but this practice is now rare, due to the enforcement of pure-seed laws. The two kinds of bur clover may be distinguished by their seeds (figs. 6 and 7) as well as by their burs.

## TOOTHED BUR CLOVER.

The average yield in California is from 300 to 500 pounds of hulled seeds per acre. This seed weighs about 60 pounds to the bushel. One bushel of clean, dry burs weighs 6 to 12 pounds and contains 2 to 4 pounds of seed.

## SPOTTED BUR CLOVER.

From a good stand the average yield of burs per acre in the South is about 500 pounds, but yields of 1,200 or even 1,500 pounds per acre are recorded. One bushel of spotted bur-clover seed in the bur weighs from 6 to 14 pounds. A hundred pounds of the clean burs contain 30 pounds of seed. The yield of clean seed per acre is therefore 150 to 360 pounds, or about half the yield of toothed bur clover secured in California.

## CHEMICAL ANALYSES.

The chemical analysis of a forage plant is valuable mainly as it indicates close similarity to another plant whose feeding value is comparatively well known. It will be noted that the composition of bur clover is very similar to that of alfalfa, but there is less fiber and somewhat more fat (ether extract) and protein, all of which are favorable differences. In all probability the feeding value of bur clover is practically the same as that of alfalfa. Analyses of bur clover made at the agricultural experiment stations of seven States, compared with analyses of green alfalfa and alfalfa hay, are shown in Table I.

TABLE I.—*Chemical analyses of bur clover.*

[Compiled by G. L. Bldwell, Bureau of Chemistry.]

Reference data. <sup>1</sup>	Moisture in original sample.	Reduced to a dry-matter basis (per cent).				
		Ash.	Ether extract.	Crude fiber.	Nitro- gen-free extract.	Protein.
	<i>Per cent.</i>					
Texas Exp. Sta. Bul. 20.....	79.51	12.76	7.73	15.34	38.56	25.61
Do.....	73.81	8.89	7.44	22.36	40.09	21.12
Tenn. Agr. Exp. Sta. Bul. 3, vol. 9.....	84.32	12.55	10.50	17.21	31.56	23.18
South Dakota Exp. Sta. Bul. 69.....	4.82	24.14	2.11	19.90	40.13	13.72
Alabama Exp. Sta. Bul. 165.....	7.59	10.70	4.57	27.81	35.82	21.10
Mississippi Exp. Sta. Ann. Rept. 1895.....	10.69	3.17	20.77	46.24	19.13	19.13
Do.....	11.71	10.23	21.73	32.39	23.94	23.94
Louisiana Exp. Sta. Bul. 19, series 2.....	11.15	10.49	4.67	35.74	34.86	14.24
California Exp. Sta. Bul. 125.....	8.95	5.49	3.95	33.59	41.98	14.99
Average, 9 samples.....		11.93	6.04	23.83	37.97	20.23
Alfalfa, green, 23 samples.....	71.8	9.57	3.55	26.24	43.62	17.02
Alfalfa hay, 21 samples.....	8.4	8.08	2.40	27.29	46.62	15.61
Average, alfalfa, 44 samples.....		8.86	3.00	26.74	45.05	16.35

<sup>1</sup> The analyses of the experiment stations of Alabama, Louisiana, and Mississippi, and probably those of the Texas station, are of spotted bur clover; that of California is in all probability toothed bur clover.

### INSECT ENEMIES.

The only insect that does any serious damage to bur clover is the clover-seed chalcis fly, which also attacks red clover and alfalfa. The small flylike insect lays its eggs through the green pods into the soft seeds, which they hatch and develop, becoming mature insects and emerging by the time the seeds are ripe or later. The quantity of seed thus destroyed is considerable. In California probably 10 per cent of the early-maturing seed is destroyed, while the loss of late seed may be as high as 75 per cent. In the South the loss is probably not so great. No practical way of controlling this insect in bur clover is known. It does no harm to the herbage.

### OBJECTIONS TO BUR CLOVER.

Three objections have been advanced against the use of bur clover as a forage crop:

(1) The relative unpalatability of the plant. This is most marked in the case of horses and mules, but other animals do not take to it readily at first. However, all farm animals kept on pastures soon acquire a taste for bur clover and then eat it freely.

(2) The small amount of growth. This objection applies mainly to poor soils and to the northern portions of the cotton belt. Even where the growth is very small it is practically always sufficient to prevent the washing of the soil, and this, together with the very insignificant cost of securing a stand each year and the marked ability of the plant to grow in cool weather, makes it valuable even though the growth is not large.

(3) The burs become entangled in the wool of sheep and thus reduce its value. This objection applies particularly to California and other regions where bur clover is abundantly established on range lands. The value of the forage far outweighs, however, the small damage due to the burs. On cultivated land the objection scarcely applies, as it is so easily avoided, if desired, by removing the sheep from the pasture after the burs are ripe or else pasturing it so heavily that but few burs are formed. It is mainly on account of the above objection that a spineless variety of bur clover is considered desirable on cultivated land.

**PUBLICATIONS OF U. S. DEPARTMENT OF AGRICULTURE  
RELATING TO FORAGE CROPS.**

**AVAILABLE FOR FREE DISTRIBUTION.**

- Rape as a Forage Crop. Farmers' Bulletin 164.  
Clover Farming on the Sandy Jack-pine Lands of the North. Farmers' Bulletin 323.  
Alfalfa. Farmers' Bulletin 339.  
Soy Beans. Farmers' Bulletin 372.  
Red Clover. By J. M. Westgate and F. H. Hillman. Pp. 48, figs. 25, tables 2. 1911. (Farmers' Bulletin 455.)  
Crimson Clover: Utilization. Farmers' Bulletin 579.  
Crimson Clover: Seed Production. Farmers' Bulletin 646.  
Alfalfa Attacked by the Clover-root Curculio. Farmers' Bulletin 649.  
Hard Clover Seed and Its Treatment in Hulling. Farmers' Bulletin 676.  
Clover-seed Production in the Willamette Valley, Oregon. Bureau of Plant Industry Circular 28.

**FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS.**

- Some Important Grasses and Forage Plants for the Gulf Coast Region. Farmers' Bulletin 300. Price, 5 cents.  
The Reseeding of Depleted Range and Native Pastures. Bureau of Plant Industry Bulletin 117. Price, 10 cents.  
The Wild Alfalfas and Clovers of Siberia, with a Perspective View of the Alfalfas of the World. Bureau of Plant Industry Bulletin 150. Price, 10 cents.  
Variegated Alfalfa. Bureau of Plant Industry Bulletin 169. Price, 10 cents.  
Grimm Alfalfa and Its Utilization in the Northwest. Bureau of Plant Industry Bulletin 209. Price, 10 cents.